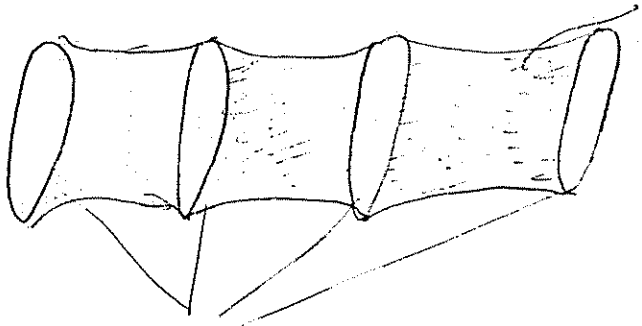
July 17, 1989

"Hoops and Stocking" Stent Concept

A new design concept for a coronary stent was conceived. This concept consists of a series of thin, stiff circular rings placed longitudinally along the length of the stent. The rings are held together by a porous, stocking-like mesh material. Structurally, this stent would be similar to the human thorax or a vacuum cleaner hose.



mesh (thin, flexible, porous, biodegradable?)

rings (metal, plastic?)

The stent's main feature is its flexibility in & out of longitudinal plane bending. Because of this it can bend with the artery, thus allowing the artery to transmit pulsation through it. The stiff rings and the mesh work to hold the artery or stenosis open, & in doing so, loose flaps in the artery are also "tacked" up.

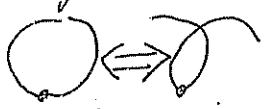
To deliver the stent to the stenosis a balloon catheter system can be used. In order to achieve a reduction in the profile of the stent during delivery, the stent can be collapsed as shown

(in collapsed state rings are just "pushed over")

rings tipped over

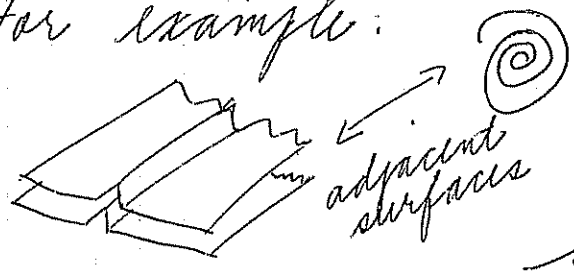
Tipping the rings over only achieves a profile reduction in one plane. The rings can also be collapsed for a reduced profile.

In both cases, inflation of the delivery balloon erects the rings and/or struts into its desired operating configuration.

Other means of of obtaining a reduced profile include using "non-solid" rings. For example, hinged rings  or ~~by~~ tie-wrap type mechanisms for locking or adjustable rings.

rings can be coiled into a collapsed state. Indentations or teeth on the surfaces can provide a locking mechanism which holds the ring diameter constant and also provides a guiding or alignment mechanism.

For example:

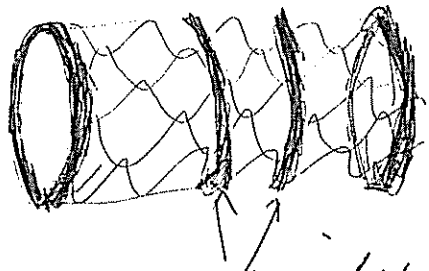


Stephen Daniel 9/11/89

Lilja Law 7/17/1989

January 17, 1990

In addition, circumferential bands could be incorporated into the structure as reinforcing hoops. These hoops would hold the stent open but the links therebetween would be responsible for ~~function~~ supporting any distortions or flaps. These rings could be made out of a material which expands with heat. The rings would thus be elastically deformed to remain at a larger diameter.



reinforcing rings

Lilip Lau 1/17/1990

Steve Boyle 1/30/90